

TERRA

THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

VOL. 26, NO. 4 • MARCH/APRIL 1988



MUSEUM ON THE MOVE

SEVENTY-FIFTH ANNIVERSARY CELEBRATION

Everything's Coming Up Diamonds. In 1988, the museum will celebrate its Diamond Jubilee year with dazzle with a spectacular display of world-famous diamonds from the Smithsonian's collection. The jewels will change every three months throughout the anniversary year.

Kicking off the diamond display is the opulent Victoria-Transvaal Necklace, which will be on view through March 12. This necklace features a stunning 67.89-carat stone surrounded by 108 smaller diamonds. The necklace's pear-shaped, champagne-colored centerpiece has 116 facets. Because the Victoria-Transvaal was featured in several Hollywood films, it is an especially appropriate accompaniment to the **Hollywood: Legend and Reality** exhibit. Other famous diamonds scheduled for the gem vault include the Empress Marie Louise Diadem and the Napoleon Necklace (March 14–June 12), the Oppenheimer Diamond and Portuguese Diamond (June 13–September 11), Eugenie Blue Diamond and Marie Antoinette Earrings (September 12–December 31).

Seventy-Fifth Anniversary Exhibitions. While **Hollywood: Legend and Reality** inaugurated the museum's Diamond Jubilee year, the occasion is being celebrated with many other special exhibitions:

The Museum at Seventy-Five: Retrospective	Through 1988
Birds in Art	Through March 6
Chinese Paper Cuts	Through May 1988
Orders of the World	March 19–December 6
Art from the Navajo Loom: The William Randolph Hearst Collection	March 25–July 31
Fossils from the Australian Dreamtime: Kadimakara	April 9–June 26
King Herod's Dream	July 16–October 9
Treasures of the Tar Pits	August 9–September 11
Lost and Found Traditions: Native American Art 1965–85	October 8–December 11

Come help us celebrate our seventy-fifth year!

Treasures of the Tar Pits: A Diamond Jubilee Touring Exhibition. In honor of the Diamond Jubilee celebration, the museum is mounting a special international touring exhibition titled **Treasures of the Tar Pits**, which features specially selected specimens from the museum's collection of fossils recovered from Rancho La Brea, one of the richest deposits of Ice Age fossils in the world and site of the George C. Page Museum.

The exhibition will be on view at the museum from August 9 through September 11 and will begin its international tour in October 1988. It presents a comprehensive picture of the history and significance of the Rancho La Brea site. Original fossil material, including six fully articulated skeletons and selected fossils representing the 565 species recovered from the asphalt deposits, are featured. A mural, designed to travel with the exhibit, has been commissioned to give an overall visual impression of life forty thousand years ago. Interactive materials will include an audio-visual program, traveling tar pit, and a touch bone.

An extensive touring schedule throughout the United States and Canada includes the Indiana State Museum, the Science Museum in Boston, the American Museum of Natural History in New York, the Academy of Sciences in Philadelphia, the Maryland Science Center in Baltimore, the National Museum of Natural History (Smithsonian Institution), the Royal Ontario Museum, and the Houston Museum of Natural Science.

AT&T Donates Unique Computer System to Page Museum. AT&T has donated a computer system that, when combined with a sonic digitizer purchased by the museum with an anonymous donation, will enable paleontologists to measure and record instantaneously a fossil's position in a deposit and then generate a video image for study. The system will be on public view in the Page Museum's fishbowl laboratory.

According to Assistant Curator George Jefferson, the system's measurement and recording capability alone "should result in a 60 percent time savings" over conventional measurement techniques. Its recording capability "will completely eliminate" the time-con-

Continued on page 28

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TERRA

THE MEMBERS' MAGAZINE
OF THE NATURAL HISTORY MUSEUM
OF LOS ANGELES COUNTY
AND THE PAGE MUSEUM
OF LA BREA DISCOVERIES

VOL. 26, NO. 4 • MARCH/APRIL 1988



COVER: A view of the Lancaster Poppy Preserve, photograph by Ballenger/Tulley.

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The dicynodont was a mammallike reptile that lived in Australia 240 million years ago. See page 22 for more Australian dreamtime animals.

FLOWER PHOTOGRAPHY FOR THE FUN OF IT

Article and Photographs by
NOELLA BALLENGER and JALIEN TULLEY



Long lenses can help you photographically reach relatively inaccessible areas. A 200mm lens was used to capture these penstemons in the Eastern Sierra Nevada Mountains.



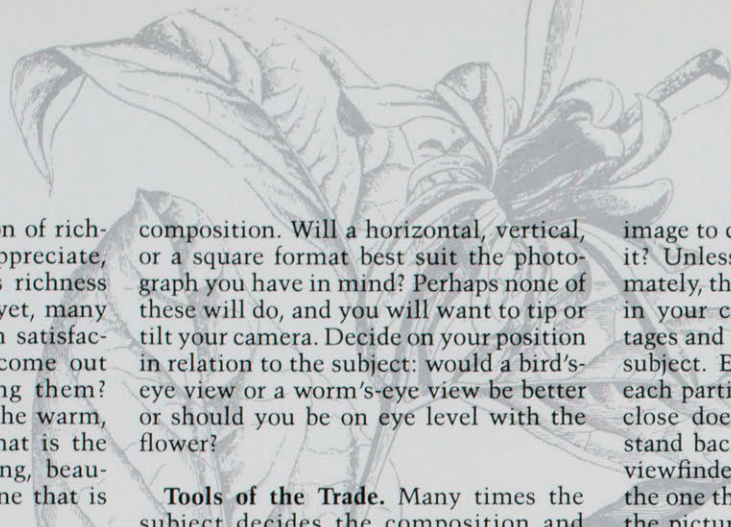
Bad weather is good weather! On overcast days light is diffused by the clouds, and colors appear more intense and saturated. These California poppies were photographed in Montana de Oro.



A flower does not have to be in full bloom to make an interesting photograph. This milkweed in its seed stage was dramatically backlit by early morning sun at Mammoth Lakes.

Wide angle lenses (20mm-28mm) allow expansion of space. Get down low and close to your subject. These mountain irises were photographed near the Gold Rush ghost town of Bodie.





Nature is an explosion of richness. To see, to appreciate, and to capture this richness on film is the challenge. And yet, many times our results are less than satisfactory. Why don't the images come out the way we remember seeing them? What goes wrong? Why isn't the warm, intimate feeling captured? What is the difference between an exciting, beautiful flower photograph and one that is just so-so?

As with any kind of photography, good flower images begin with learning to see. This means really looking at what you are going to shoot: look at it from the side and notice the curve of the stem and the balance of the flower. Look at it from the top and imagine that you are an insect coming in for a landing. Notice the symmetry of the petals around the center. Begin to look even closer; perhaps you will see grains of pollen. Look up at the flower from its underside and note the change in color and textures. Look at the leaves, the veins, and the joining at the stem. As you get into the habit of careful observation, images will begin to form in your mind. Your creative juices will start to flow, and that is when the fun begins!

Compose Yourself. Composition is the arrangement of elements within your photograph. Some of these elements include form, color, line, and space. What is the most important element in the composition you are considering? Is it the shape, the form, the texture, the pattern, or the arrangement of light and shadow? There are many decisions to be made when choosing the central theme or subject of your photograph. This center of interest should be the strongest area in the photograph, but just because it is the center of interest does not mean that it should be in the center of your viewfinder.

Carefully balancing the various components of your composition contributes to the overall harmony and pleasing appearance of the final product. These decisions need to be made with deliberation. Don't allow them to just happen. Strong compositions and dynamic photographs are the result of planning and attention to detail.

Not only must you carefully observe the subject that you wish to photograph, but learn to observe everything that is in the viewfinder of your camera. See what is really there and not just what you want to be there. If you see something that is not pleasing to your eye, remove it, disguise it, or change your position to eliminate it from the viewfinder. You can use clothespins and fishing line to hold unwanted material out of the way.

Format plays an important role in

composition. Will a horizontal, vertical, or a square format best suit the photograph you have in mind? Perhaps none of these will do, and you will want to tip or tilt your camera. Decide on your position in relation to the subject: would a bird's-eye view or a worm's-eye view be better or should you be on eye level with the flower?

Tools of the Trade. Many times the subject decides the composition and equipment you should use. It is important to know your equipment well, understand the function of each piece, and explore its capabilities fully. The most versatile camera is the 35mm single-lens reflex (SLR) with interchangeable lenses. A through-the-lens (TTL) light-metering system can be most helpful as is a depth-of-field preview button.

Any lens can be used in flower photography from ultra wide angle (20mm) to super telephoto (500 to 1000mm). Each lens gives its own distinctive image characteristic. Wide-angle lenses can distort a normal view to emphasize size while the telephoto lens eliminates unwanted background distractions and isolates the subject. Macro lenses or lenses with a macro mode enable you to get closer so that the image size on the film is larger.

For closer range magnification, diopter lenses provide an inexpensive alternative. Diopters screw on the front of your lens just like a filter, adding a slight magnification to the image. They are available in a variety of strengths and frequently come in a set of three. These can be used alone or stacked together depending on what magnification you desire.

Another equipment option is the extension tube. The tube is a simple spacer that fits between the camera body and the back of the lens. It also comes in several sizes, can be used with all lenses, and can be used alone or in combination with other tubes to make the image appear larger on the film. When you use it in combination with a telephoto lens, it allows you to move closer to your subject and increasing both isolation capabilities and image size.

The teleconverter also increases the magnification of the primary lens; that is, a 200mm lens becomes a 400mm lens with a 2X teleconverter. There are some disadvantages to both tubes and teleconverters because the price you pay for getting that larger image is a loss of light. There is no noticeable loss of light with a diopter, but there may be a sacrifice in quality of the image, especially if the diopter is not made of high-quality glass. This loss may be exaggerated when you stack several diopters together.

What lens should you use to get the

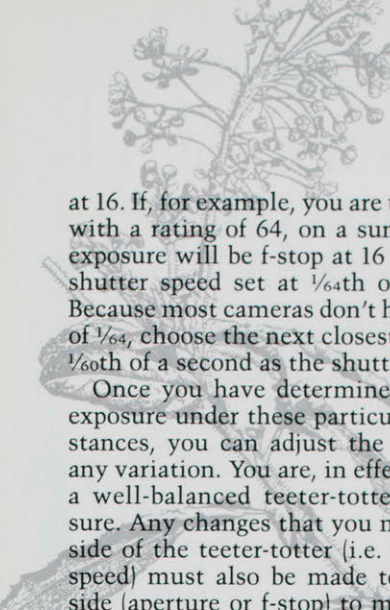
image to come out the way you perceive it? Unless you know your lenses intimately, there is no easy answer. Each lens in your camera bag has certain advantages and disadvantages for shooting any subject. Explore the full capabilities of each particular lens that you own. How close does it focus? Three feet? Then stand back three feet, look through the viewfinder, and decide if that image is the one that you want. No? Too much in the picture? Not a large enough image? Add a tube. Look again. Still not right? Try another lens. Change your position and look again. Experiment... take a few test shots and make specific notes during this period of exploration. Is the image in hand what you visualized? Yes? Great, you achieved your goal. No? Then why not? What could have been done differently? Reshoot the image and try to correct the problems. Again, experiment and take notes.

Other than macro lenses, our favorite lens for flower photography is a 200mm lens (either a zoom or a fixed-focal length). It can compress the image from foreground to background, making a few flowers appear on the image as many. It can be used to add swirls of soft misty color to help set a mood, and it also allows you to isolate that one perfect specimen in the center of a flowerbed or in a wet meadow that cannot be approached.

The Perfect Exposure. After deciding what equipment, format, and composition you want to use, your next challenge is exposure. Many photographers are uncertain of what exposure to use especially when working in the macro mode or with some of the special equipment available. A review of the simple principles of exposure and depth of field will help.

Basic exposure is determined by the amount of light striking the film as it is reflected off the subject. Film is sensitive to light and its ASA/ISO rating tells you how sensitive that particular film is. A film with an ASA/ISO rating of 100 is not as sensitive as one with an ASA/ISO rating of 200, but it is more sensitive than a film that has a rating of 50. When you set the ASA/ISO rating on your camera, you are setting the gauge that will tell your meter how to expose for the light coming off the subject for that particular film.

One of the best rules to learn and use in photography is based on your film's ASA/ISO rating and is called the Sunny 16 Rule; that is, on a bright, sunny day when the shadows are crisp and dark, the proper exposure of your film will result from setting the shutter speed at the number closest to the film's ASA rating and setting the f-stop (the lens aperture)



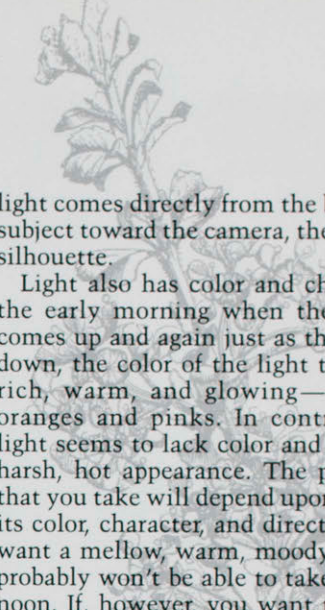
at 16. If, for example, you are using a film with a rating of 64, on a sunny day the exposure will be f-stop at 16 (or f16) and shutter speed set at $\frac{1}{64}$ th of a second. Because most cameras don't have a speed of $\frac{1}{64}$, choose the next closest number of $\frac{1}{60}$ th of a second as the shutter speed.

Once you have determined the basic exposure under these particular circumstances, you can adjust the camera for any variation. You are, in effect, creating a well-balanced teeter-totter for exposure. Any changes that you make to one side of the teeter-totter (i.e. the shutter speed) must also be made to the other side (aperture or f-stop) to maintain the balance.

Also remember that any additional lenses will result in the loss of light and must be taken into account when computing basic exposure for a particular setup. For example, if you are using a 2X teleconverter between your lens and camera, the loss of light is two full f-stops. Therefore, instead of the basic exposure being Sunny 16, it would be Sunny 16 minus two full stops or Sunny 8. If your camera has a TTL metering system, it will automatically compute any of the adjustments that need to be made.

To ensure the best exposure, try bracketing your photographs, that is, make additional exposures on either side of what you assume is the correct exposure. If your meter tells you that the correct exposure is a shutter speed of $\frac{1}{60}$ at f16, you could bracket by keeping the aperture the same and changing the shutter speed, shooting additional shots at f16 at $\frac{1}{60}$, $\frac{1}{30}$, or $\frac{1}{125}$. You could also bracket by shooting $\frac{1}{60}$ at f16, f11, or f22, in which the shutter speed remains the same and only the aperture changes. Either way you will have three exposures to choose from: one at the meter reading, one overexposed, and one underexposed. Sometimes, even though the original exposure is technically correct, you may prefer the lighter or darker one.

Follow that Light. Besides affecting the exposure of your film, light can make the difference between a dramatic or flat photograph. Be aware of light and how it strikes the subject. Is it coming from overhead, from one side or the other, or directly toward you? What is it doing to the subject? How does it affect the mood of the shot? Midday sun coming from directly overhead casts strong light on the top of the subject and puts dark shadows underneath making the image appear shapeless and flat. When light comes in low and from the side, the subject appears to have more shape, and the contours stand out to give the subject a more three-dimensional look. When



light comes directly from the back of the subject toward the camera, the result is a silhouette.

Light also has color and character. In the early morning when the sun first comes up and again just as the sun goes down, the color of the light tends to be rich, warm, and glowing—golds and oranges and pinks. In contrast, noon light seems to lack color and has a very harsh, hot appearance. The photograph that you take will depend upon the light: its color, character, and direction. If you want a mellow, warm, moody shot, you probably won't be able to take it at high noon. If, however, you want to say *Sun Beating Down on Sunflower*, then go out in the noonday sun.

One of the most appealing types of lighting is the spotlight effect—a small beam of light through the trees, bushes, or even clouds will happen to hit a single flower or a group of leaves in a special way. This spotlight effect can create drama just as effectively as a beam of light hitting a dancer on a stage. Take your exposure measurement on the lighted surface of the subject and don't let the meter be fooled by the shadow area surrounding it. Expose for the light and bracket for insurance. Don't worry about the shadows being too dark: a spotlight won't show unless the stage is dark.

What is the best time to take photographs? Anytime! You can use almost any weather condition to your advantage if you are prepared and willing to try it. Overcast, cloudy, and light, misty rainy days are great for flower photography. The light is soft and diffused, colors appear more vivid, and everything seems fresher. On partially cloudy days, watch the sky and wait. As the light shafts through the openings between clouds, the contrast of light and dark and the dazzling highlights with resulting color saturation make the moments of waiting worthwhile.

Put it Where it Belongs. Focusing the camera on a subject creates an area and not just a spot of sharpness on the film. *Depth of field* is the term that refers to the front-to-back area or zone of focus or sharpness. Zones of focus can be moved through the photograph and placed in the fore, middle, or background areas. The zones can also be expanded or contracted to make a very wide or a very narrow band of sharpness. The focal length of the lens will make a difference in the depth of field. Wide-angle lenses will typically have a wider zone of focus than telephoto lenses.

The f-stop controls the zone of sharpness. Use the f-stop ring on the lens to change the size of the lens's aperture, which can be adjusted from very small to

Photography Class

This three-session class taught by Noella Ballenger and Jalien Tulley will cover the finer points of photographing plants and flowers. At the first session participants will review camera equipment and basic photographic techniques. The second session at a local botanical field site will allow participants to set up and take photographs under the guidance of the instructors. During the third session, the instructors will evaluate the resulting photographs and offer suggestions for improving future work. Limited to 15 participants. \$30 members, \$35 nonmembers. Please call 213/744-3534 for more information.

very large. To see this, take the lens off your camera, hold it up to the light, and look through. Move the f-stop ring, setting first a large opening and then a small one. A large opening has a number of f4 or f2.8; a small opening has a number of f16 or f22. A simple way to remember this is "fat and fuzzy" or "skinny and sharp." A large or "fat" opening causes a limited depth of field or a larger zone of fuzziness while a small or "skinny" opening causes a larger zone of sharpness.

The fat-fuzzy/skinny-sharp rule gives us the answer to one of the most frequently asked questions in flower photography: How do you make a flower pop forward against a rich, solid color background? To do this, select a subject that is in the light and away from the background. Take a normal to long telephoto lens and focus on the flower. Determine the exposure (taking care to expose for the flower and not for the background), and use the largest f-stop possible. The background will go out of focus and appear as a solid color in the final image. Try setting up on a flower and shoot it first using this method; then, change nothing but the aperture and speed (to keep the same good exposure). Decide for yourself which one you prefer and under what situations.

Don't stop there! Explore your subject from other points of view and other positions, with other lenses and other formats. Take many photographs of the same subject in many different ways. One shot should never be enough.

Noella Ballenger and Jalien Tulley, professional nature photographers, teach botanical photography at the Los Angeles State & County Arboretum, UCLA Extension and the Natural History Museum. Their work has been published in a variety of magazines as well as frequently exhibited.



Nature's bonuses! Careful observation of insects, such as this Bodega Bay bee, allows you to learn their habits. Cautious, quiet movements may bring you close enough to take their photographs.

Five Tips to Make it Great

Steady Your Camera. When holding your camera by hand, learn to tighten your body position. Your stance should be relaxed but firm with your feet apart and elbows tucked next to your body. Your camera should be resting in the palm of one hand with the other hand ready to fire. Or try a tripod; they are a must when shooting in low-light situations. For flower photography, it is best to get a tripod that allows you to get close to the ground without reversing the center post. A quick-release device on the tripod is recommended.

Add Some Sparkle. Aluminum foil is a part of our basic camera gear. It makes a wonderful reflector and adds just a little light to the shadow side of a flower. Keep the basic exposure the same but just use the foil for a bit of sparkle to the darker areas.

Little Critters. Because a part of flower photography is bees, butterflies, and bugs, be comfortable in long pants and long-sleeve shirts. Never use cologne or perfumed sprays when going out in the field; you want the bugs on the flowers and not on you. Insect repellent is a must. And speaking of creepy crawlies, they are a part of what you are shooting and whenever possible include them in the photograph. They can be wonderful additions.

Be Nice to Yourself. Lie on the ground to take that worm's eye view, but treat yourself well and be comfortable. Tuck a large lawn trash bag into the pocket of your camera bag for just such occasions. In addition to protecting you from ground moisture, the trash bag can act as a wind break by being fastened to a low bush or some sticks with several clothespins.

Let it Rain. Water drops clinging to flowers make fascinating images. Go out into the field when the dew is on the flowers or at the end of a light rain. Be sure to include a diaper or lint-free cloth in your camera bag. It will absorb water that gets on your equipment and dry out more quickly than other cloths. Wipe down your equipment frequently when out in the field on a stormy day. A plastic shower cap covers the camera quickly between shots on a rainy day.



Sometimes you have to go to extremes to get the photograph you have envisioned. Here one of the authors shoots water lilies in a cold pond early one morning in the Eastern Sierras.

LOS ANGELES COUNTY— A WILDFLOWER CORNUCOPIA

Color Photographs and Article
by ROBERT J. GUSTAFSON

With an area encompassing 4,070 square miles and despite a burgeoning population of over seven million people, Los Angeles County possesses an amazingly diverse variety of natural habitats. Mountains, deserts, even offshore islands fall within its perimeters. Considering the urban sprawl extending from coastal communities in the west to the bedroom suburbs in the east, it seems an unlikely area in which to contemplate wildflowers. Yet the San Gabriel Mountains, the Santa Monica Mountains, the Antelope Valley, and even Santa Catalina Island are easily accessible by car (and/or boat) from Los Angeles. And for wildflower enthusiasts, a regular cornucopia of botanical wonders is at their back door.

For most Angelenos the Santa Monica Mountains are a very familiar landmark. Traversing some forty-five miles from Oxnard in Ventura County to the Los Angeles River, this range separates the San Fernando Valley from the Los Angeles basin. Its highest point, 3,111 feet at Sandstone Peak, is in the western part of the range. Much of the Santa Monica Mountains are covered by chaparral, although grasslands, oak woodland, and coastal sage scrub are also present. Wildflower displays are best observed after fires have burned through the chaparral. A number of annuals, known as *pyrophytes* (or fire-followers) come up in profusion in the wake of a fire. Whispering bells (*Emmenanthe penduliflora*), Parry's phacelia (*Phacelia parryi*), eucrypta (*Eucrypta chrysanthemifolia*), and firehearts (*Dicentra ochroleuca*) are just some of the colorful species to be encountered some months after a fire. Sometimes the wildflower displays in the Santa Monicas rival anything to be seen in the deserts. In addition, such bulbous plants as mariposas (*Calochortus catalinae* and *C. plummerae*), star-lilies (*Zygadenus fremontii*), golden-stars (*Bloomeria crocea*), and blue-dicks (*Dichelostemma capitata*) are often abundant.

In late May or early June the conspicuous towerlike spikes of yucca (*Yucca whipplei*) are a common sight in coastal-scrub and chaparral communities. Showy species like scarlet larkspur



(*Delphinium cardinale*), bush-monkey-flower (*Diplacus longiflorus*), heart-leaved bush penstemon (*Keckiella cordifolia*), and fuchsia flowered gooseberry (*Ribes speciosum*) never fail to attract attention. The shrubs of the chaparral, chamise (*Adenostema fasciculatum*), California lilacs (*Ceanothus* sp.), holly-leaved cherry (*Prunus ilicifolia*), and sugar bush (*Rhus ovata*) also add color to the foothills in the spring. Because of the easy accessibility of the Santa Monica Mountains, this range has been heavily impacted. Fortunately, the Santa Monica Mountains National Recreation Area has been set aside so that future generations of southern Californians will be able to enjoy them. Fine stands of chaparral and oak-woodland can be seen at Charmlee, live oak and grassy meadows at Arroyo Sequit, all of which are part of the park system.

The San Gabriel range (or the Sierra Madre, as it was known to the early Spanish inhabitants) extends from the

vicinity of Soledad Canyon in the west and traverses some sixty-three miles to Cajon Pass in the east. Occupying the northern quarter of Los Angeles County, most of the range is in the Angeles National Forest (some 700,000 acres). Mount San Antonio (or Old Baldy) is over 10,000 feet, making it the highest point in the county.

About a dozen major vegetation zones, from chaparral and oak woodland at lower elevations to alpine fell-fields above timberline on Mount Baldy, are scattered throughout the mountains. In springtime the chaparral communities can be spectacular when the California lilacs are in bloom, coloring the hillsides with blue and white. Dense stands of white-flowered chamise, lavender flowers of prickly phlox (*Leptodactylon californicum*), and chrome yellow bush poppies (*Dendromecon rigida*) can be knockouts in a good year. Flannel-bush (*Fremontodendron californicum*), one of the components of the desert chaparral on the northern flanks of the range be-

tween 3,000 and 6,000 feet, is one of California's most beautiful shrubs. Annuals such as fiddlenecks (*Amsinckia* spp.), lupines (*Lupinus* spp.), phacelia (*Phacelia* spp.), popcorn flowers (*Cryptantha* spp.), and perennials like showy penstemon (*Penstemon spectabilis*), paint-brush (*Castilleja affinis*), black sage (*Salvia mellifera*), white sage (*Salvia apiana*), and scarlet bugler (*Penstemon centranthifolius*) also color up the landscape.

Above 4,500 feet the yellow pine forest begins. Here ponderosa, Jeffrey, and Coulter pines dominate along with incense cedar and white fir. Manzanita (*Arctostaphylos glandulosa*, *parryana*, and so on), snow bush (*Ceanothus cordulatus*), gooseberries (*Ribes nevadense*, *roezlii*, *lasianthum*) are com-

Tree Poppy



mon and colorful. The luminous red snow plants (*Sarcodes sanguinea*) are scattered here and there in the dry humus. Turricula (*Turricula parryi*) is a spectacular plant in flower with its large panicles of lavender blossoms, but woe be to the person who comes into contact with the plant. It causes a severe dermatitis, not unlike poison ivy, in many people. Green-gentians (*Frasera parryi*), snowdrop-bush (*Styrax officinalis* var. *fulvescens*) and mountain dogwood (*Cornus nuttallii*) are not commonly encountered but certainly are impressive.

The Antelope Valley in the northeast sector of Los Angeles County is probably the best place to see fields of wildflowers, in particular California poppies (*Escholtzia californica*), owl's clover (*Orthocarpus purpuascens*), and lupines. This

westernmost extension of the Mojave Desert is host to a number of preserves where in a wet year one can still glimpse vestiges of what was once known as California's "golden mantle." The Poppy Preserve, north of Fairmont, Saddleback Buttes State Park, Butte Valley Wildflower Sanctuary, the Theodore Payne Wildlife Sanctuary, Alpine Butte Sanctuary, and the Phacelia Wildflower Sanctuary are all worthwhile places to visit. Northeast of Lancaster one can see the distinctive squaw cabbage (*Caulanthus inflatus*) with its chartreuse stems and purple-and-white flowers. Phacelias, fiddlenecks, and evening primroses (*Oenothera californica*) also provide good shows of color.

Can we anticipate a good crop of wildflowers this spring? Many variables af-

fect whether flowers will bloom in profusion or not. Rainfall is always critical to a spectacular wildflower display in the deserts, but other factors such as temperature are also important. One bumper year for wildflowers in southern California was 1978; in 1983, the year of El Niño and one of the wettest on record, the floral displays were disappointing because of a prolonged cool spring.

Robert Gustafson, Collections Manager in Botany, has had a long-standing interest in rare and endangered plants not only in California but also the Hawaiian Islands. He recently published *Plants and Flowers of Hawai'i* with S. H. Sohmer (University of Hawaii Press).

Snow Plant



Giant Phacelia



Indian Paintbrush



Wildflower Show
Saturday and Sunday, April
9-10

The California Native Plant Society (the Santa Monica Mountains Chapter) and the Natural History Museum will be hosting this floral extravaganza featuring the wildflowers found in the Santa Monica Mountains Recreation Area and around southern California. Main foyer, 10 a.m. to 5 p.m., free.



Where have all the flowers gone? Gone to condominiums, parking lots, and agricultural fields. Gone to foxtail grass, filaree, and mustard. What man has wrought, deliberately or accidentally, has had a profound and in essence an irreversible effect on the flora of southern California. One can only hope that these vestiges of our floral heritage will still remain for future generations to behold, even if they are relegated to a few wildlife sanctuaries, parks, and preserves. But the glory of the wildflower fields of one hundred years ago can best be remembered in photographs of gentlemen in bowler hats and ladies in Sunday finery sitting in poppy fields near Mount Lowe and the California lilacs blooming in a view of the undeveloped Malibu coastline early in the century. Photographs courtesy Seaver Center for Western History Research.



ORDERS OF CHIVALRY

These Awards for Merit and Achievement
Reflect the History of the World in Miniature

A Short History

by DONALD CHAPUT

Admission to an order of chivalry is a reward for a successful career and is often bestowed on members of ruling families and outstanding diplomats, military figures, artists, scientists, and other distinguished achievers. In contrast, decorations are usually awarded for a specific outstanding act of bravery; Britain's Victoria Cross is the best-known example of a decoration. Medals are given to those who participate in particular military campaigns and are awarded for wounds, good conduct, and meritorious service. In civilian life, medals have been awarded by heads of state to thousands of writers, musicians, inventors, farmers, life-saving crews, and others judged to be deserving of such recognition.

The orders of chivalry originated in the Middle Ages in Western Europe and derived from symbols the Greeks and Romans had devised—including banners, statuary, medallions, wreaths, and jeweled swords—to distinguish the powerful, successful, and wealthy from those of common rank. The concept of chivalry and knighthood was sharpened by the Crusades. Groups of knights banded together to fight for the faith and to care for pilgrims and the sick, and they devised a set of rules of admission and conduct; certain insignia, colors, and gowns became associated with membership in these orders. The Order of the Knights Templars (1118) was formed to "fight the infidel." The Order of Malta, founded in Jerusalem in 1048, was originally a hospital order, as was the Teutonic Order, founded in 1190.

After the Crusades these orders moved west from the Holy Land to Cyprus, France, Rome, and throughout Europe and retained and even enlarged their political and military power. Most orders had a leader, and membership was in three classes: knights, privates, and brother servants. Membership was truly

The Natural History Museum of Los Angeles County will be presenting the exhibition Orders of the World from March 19 through December 1988, in the museum's Director's Gallery. The museum's Robert B. Honeyman Collection is one of the world's leading medallic sources; many of these medals are rare, each one is a compendium of its country's history and traditions. We are concentrating in this issue of TERRA on the history of orders of chivalry, modern orders, and three unusual orders that will be on display in the exhibition.

exclusive, as only those of the nobility were admitted. By the end of the Middle Ages, Malta and the Templars were powerful forces in Western Europe, and the Teutonic Order was the most important military-political force in Prussia and in the Baltic region.

In the same era, in the Iberian Peninsula, the fight was under way to defeat the Moors. The famous military orders of Spain and Portugal were born during this struggle: Alcantara (1177), Calatrava (1158), Aviz (1162), Santiago (1290), and Monteza (1317).

By the 1300s, however, Europe was involved in a subtle power struggle. Monarchs achieved increased power at the expense of the nobles; in addition to bringing the orders into their orbits, kings created new orders that strengthened their position. Some of these important temporal (rather than spiritual) orders were the Garter (England, 1348), Elephant (Denmark, 1462), and Seraphim (Sweden, 1280).

In 1693 King Louis XIV of France initiated a drastic change in the philosophy of orders by creating the Order of Saint Louis, the first true order of merit. Nobility was no longer a requirement for membership; long, dedicated service to the king or important military service could lead to a man receiving a Cross of Saint Louis regardless of the status of his ancestors. Louis XIV was not only rewarding merit; he was issuing a further blow to the nobility to make it more humble and subservient to him.

By the eighteenth century much of the symbolism of orders had become established. The design of the various insignia could include stars, flowers, portraits of

saints, dragons, initials, and mottoes. Certain colors were specified, and the badges, breast stars, or collars were worn in certain positions and on special occasions. Robes, mantles, even garters, became part of the mystique.

The names of the orders were derived from many traditions. The early monastic orders, such as the Templars, referred to their place of origin (the Temple of Jerusalem). Many Spanish orders, such as Alcantara, refer to fortresses. A national symbol could be the inspiration, such as in Japan's Order of the Chrysanthemum. The Serbian Order of Takawo refers to an important battle in the country's independence struggle. Many orders are named for saints, such as the Russian Order of Saint Anne and the Bulgarian Order of Saint Alexander. The Republic of Peru created an Order of the Sun, one of the important ancient Inca symbols.

Most orders are either military or civilian. Finland's Order of the Cross of Liberty and Germany's Iron Cross, for example, have only been awarded during wartime. Some civilian orders are rather specific, such as the French Order of Academic Palms. On the other hand, the Order of the British Empire has been awarded for scholarship, a successful career, or notable service to the state. A few orders are mixed, capable of being awarded to the military or to civilians: the Czech Order of the White Lion is such an order. In these mixed orders, a set of crossed swords in the insignia is often used to indicate military rather than civilian membership.

A few orders were limited to women, such as the Greek Order for Good Deeds,



The Order of the Illustrious Ottoman Dynasty was reserved for members of the ruling family of the nineteenth-century Turkish empire. Photograph by John De Leon.



A member of the British Order of the Garter in full regalia.



(Top) Order Pour le Mérite, Prussia's highest military order. (Right) Japan's Order of the Chrysanthemum. (Below) The grouping of three is Ethiopian; on the left is King Solomon's Seal, next is the order of Menelik II; the medal or badge on the right has not yet been identified. Photograph by John De Leon.



Crown Prince William of Prussia sporting several unidentified medals.

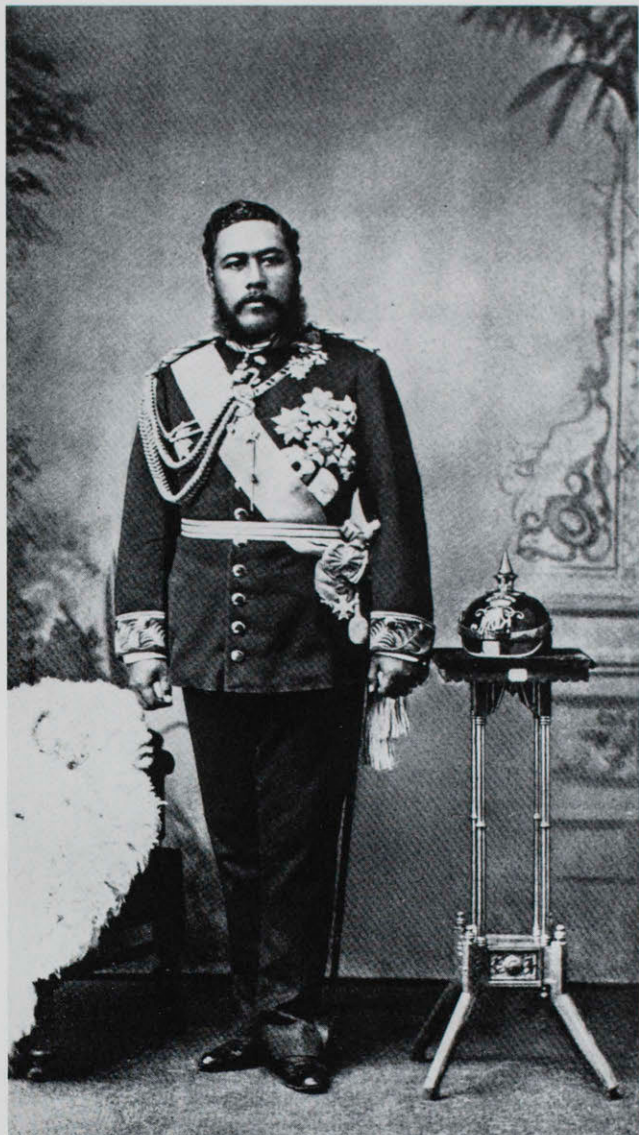


established in 1948, and the Russian Order of Saint Catherine (1714). In 1766, in Bavaria, the Order of Saint Elizabeth was created for ladies of the nobility. There are also personal or house orders, in which the ruling monarch rewarded close family members and those who provided long and faithful service to the crown. Many of the German princely states had house orders. In 1896 Queen Victoria established the Royal Victorian Order for similar reasons, as did the Dutch king in creating the Order of the Family of Orange in 1905. In 1869 the King of Siam established the Holy Order, which was limited to members of the royal family.

The French Legion of Honor, established by Napoleon in 1802, became the prototype for most modern orders. The French Revolution had a leveling effect, and membership in this order was a way to recognize military and civilian deeds of the people, regardless of their class origins. It is usual in the Legion of Honor, and in most orders, to be admitted at lower levels and move up if the career justifies it (the illustration on page 17 shows just such a promotion).

Orders have statutes, traditions, policies, regalia, insignia, mottoes, a slate of officers, and a grand master, often the monarch or president of a country. Some orders have a particular administrator as well as a domicile. In Scotland, for example, the administrator of the Order of the Thistle is called the Lyon King of Arms, and the order is headquartered in Saint Giles Cathedral, Edinburgh.

Very few orders ever conferred nobility, although several German princely states and most Russian orders were exceptions to this. Nonhereditary knighthood is often associated with membership in orders, but in some orders, only the higher classes receive knighthood. For example: a man styled John Jones, C.B., is a companion in the Order of the Bath, but not a knight (hence, not "Sir"). However, Sir Richard Richards, G.C.B. (Grand Cross, Bath), is in the highest class of the Order of the Bath, therefore is a knight, and is addressed as "Sir"; his wife is called "Lady Richards." In the British system, a woman who is admitted into the highest



King Kalakaua of Hawaii, in a photograph taken in 1890, wears a variety of Hawaiian and foreign orders.



This 1913 French magazine reports the promotion of the 92-year-old veteran of North African campaign, trumpeter Rolland, to officer in the Legion of Honor.

categories is entitled "Dame."

How does one become a member of an order? The English had a saying: "whosoever requests an Order for himself is prevented from receiving it forever." The trick is to have other influential individuals and agencies lobby on one's behalf and when such recognition comes, one must remember to feign surprise.

We in the United States, who grant stardom to billionaires, quarterbacks, game show hostesses, and politicians, have difficulty in understanding the traditions of orders. But in societies that have them, orders are a formal and well-publicized way of recognizing merit and status. Orders also figure in matters of precedence, which can rule such matters as when one gets to see the king, whether

or not one is invited to a certain wedding, or who one is seated next to at a county fair luncheon.

Americans ought not to see orders as antidemocratic. Australia, every bit as democratic as the United States, not only participates in the British system of orders but in the 1970s created one of her own, the Order of Australia. This is another award of merit, and because of it, recognition has been given to hundreds of Australian artists, historians, bankers, sports figures, financiers, mining magnates, and educators.

Donald Chaput is Chief Curator of the History Division. Shirley McGurk, Museum Associate, has done extensive work on the Honeyman Collection over the years.

A CLOSER LOOK AT THREE UNUSUAL ORDERS

by Gustav von Tammann

*Breast star, Order of the Bath, type of 1800-15. The star has no silver marks, but was apparently made by one of the very good London jewelers, as evidenced in the excellent workmanship and the hinged rays, which allow the star to adjust to the body movements of the bearer. The insignia displays three crowns and the motto of the order *Tria Juncta in Uno* (three united in one). The crowns symbolize the kingdoms of England, Scotland, and France. When George III adopted the title of King of Ireland in 1802 he had shortly before divested himself of the empty title of King of France, and correspondingly the meaning of the third crown changed. Photograph by John De Leon.*

The Order of the Bath

The Knights of the Bath, known at least since 1399, were a group of gentlemen who were knighted during the coronation of the king or at similar occasions. One of the rites, which may go back to Saxon times, consisted of bathing, symbolic of purification. During the ceremony the candidates received precious robes from the sovereign, and the knights wore—at least from the seventeenth century—particular badges. But this fraternity of special knights lacked statutes, and the designation of an order does not apply.

The actual foundation of the Most Honourable Military Order of the Bath took place on January 25, 1725, when the first statutes were issued by King George I. In spite of its name, the order was not restricted to military persons; by the end of the eighteenth century many of the great naval and military leaders were included in the order, but the remaining members consisted mainly of eminent ambassadors. The order, which was bestowed at the sole discretion of the king, consisted of one class only, the Knight Companions of the

Bath, who were authorized to use the letters K.B. after their names. The membership of the order was limited to the sovereign, a royal prince, the Great Master, and thirty-five knights, but some supernumerary knights were installed during the wars against Napoleon.

The Order of the Bath flourishes to the present day. Membership is for life, whereas in earlier days one had to resign from the order when one received the Order of the Garter. The order has seven officers. After the Great Master they take precedence in the following order: the Dean (always the Dean of Westminster), the King of Arms, the Registrar and Secretary, the Genealogist, the Gentleman Usher, and the Deputy Secretary. The order has also its own chapel in the Abbey Church of Westminster.

Solemn services of the order are usually held in Westminster Abbey every four years. They are attended by a large number of members of the order as well as Gentlemen-at-Arms and the Queen's Bodyguard of the Yeomen of the Guard. The highest-ranking members of the order wear crimson mantles and move in procession through the abbey to the chapel, where a ceremony takes place. New knights are installed and swear an oath of loyalty to the sovereign.

In 1815, the order underwent a major reform and was divided into a military and a civil division. The knights of the latter division received the designation Knights Grand Cross (G.C.B.), while the military division consisted of three classes, Knights Grand Cross, Knight Commanders (K.C.B.), and Companions (C.B.). In 1847 the civil division was divided into the same three classes. The opening of the order to the newly wealthy was resented by many of the old members. There was indeed some temporary loss of prestige of the order in the second half of the nineteenth century, but it resumed its original glamour when the lower ranking merit orders of Saint Michael and Saint George and the Royal Victorian were founded.

The Knights of the Bath originally had to buy their own insignia. Because of the considerable cost, only wealthy people could afford membership. When some impoverished officers bluntly refused to pay, the chapter of the order acquired a supply of insignia that were given to new members. From then on the insignia had to be returned upon death.



The Russian Order of Saint Anne

Czarist Russia had a very rigid hierarchical system. All civil servants and military persons were assigned according to their rank to certain classes, the so-called *chins*. While a registrar or cadet belonged to the lowest or fourteenth chin, an acting councillor of state or a general major of the army was in the fourth chin and automatically acquired hereditary nobility. The first chin was occupied by the acting privy councillors first class and the general field marshals. Every subject of the empire and even foreigners could advance throughout the whole scale of chins on the basis of abilities and achievements.

The bestowal of orders was strictly bound to the chin system. The lowest order, the Saint Stanislas third class, could only be acquired by a person in the twelfth chin (governmental secretary or lieutenant). The Saint Anne first class was reserved for those in the fourth chin. The higher Russian orders of the White Eagle, Saint Alexander Nevsky, and Saint Andrew were reserved for still higher chins. Only the very prestigious Order of Saint George for bravery was not directly tied to the chin system; later this was also the case for the Order of Saint Vladimir.

The Order of Saint Anne was founded by Charles Frederick, Duke of Schleswig-Holstein-Gottorp, in memory of his wife, Anna, the daughter of Czar Peter the Great, on February 3, 1735, which is also the festival day for the order. The order originally consisted of one class and had only fifteen knights. The founder's grandson Czar Paul I established it as a Russian order of merit in 1797, issued statutes, and enlarged it to three classes. The order flourished until the end of the czarist rule and was taken over by the short-lived revolutionary Kerensky government in 1917. Until 1920 the order was distributed by the White Army's generals who fought the Bolsheviks. After the Grandduke Kirill proclaimed himself head of the imperial House of Romanov in exile and Curator of the Throne in 1922, he occasionally bestowed the Order of Saint Anne.

Everybody who received the Order of Saint Anne following its establishment in the late eighteenth century had to pay an entrance fee according to the class. The fee for the first class increased with time to 200 rubles, which corresponds in modern money roughly to \$8,000. The fees were administered by the council of the order, which paid pensions to deserving older members of the order (annually up to 350 rubles for the first class). In this way the order assumed the function of a modern retirement fund.

Every few years the Order of Saint Anne was changed in some detail by ukases of the czar. Diamonds (since 1797) and a crown (1829–74) could be added to the insignia of the first and second class as a special sign of favor by the sovereign. An additional bow to the ribbon of the third class was for military deeds (since 1818). Military merit in the presence of the enemy was indicated by two crossed swords through the center of the insignia of the first three classes (since 1855), and in special cases the swords could be also attached to the upper part of the insignia of the first and second class (1855–70). The figure of Saint Anne on the badge and the red cross on the star replaced by black imperial eagles (since 1845) for orders awarded to non-Christians.

The resulting variety of insignia makes the Order of Saint Anne a pet item for collectors. In 1817 there were still 935 persons living who held the first-class badge; accounting for the members who died during the period one may estimate the total number of first-class badges that were bestowed between 1797 and 1816 at roughly 1,500. This number may seem high, but the insignia had to be returned upon death or after promotion to the Saint Alexander Nevsky Order, and many of the returned badges have probably been melted down.

The members of the first class of the Russian Order of Saint Anne wore a badge on a red sash with two narrow yellow stripes and later, an embroidered silver star (not shown). The sash was worn from the left shoulder to the right hip, which is opposite to almost all other orders; the star was attached to the right breast. The center enamel plaque shows Saint Anne; on the reverse it contains the entwined blue letters A.I.P.F. under a crown. The meaning of these initials is two-fold: Anna Imperatoris Petri Filia (Anne daughter of the Emperor Peter) and Amantibus Justitiam, Pietatem, Fidem (To lovers of justice, piety, and faith), which is the motto of the order. Photograph by John De Leon.



The Order of the Crown of Tonga

Collectors have speculated for many years on the existence of an order from the Kingdom of Tonga based mainly on the specimens in the museum's collection, but details about this order remained a mystery. History Division Chief Curator Donald Chaput, however, recently unearthed information in Australia that clarifies the history of the Order of the Crown of Tonga.

Tonga, formerly called the Friendly Islands, is a Polynesian archipelago comprising over 150 islands. It measures 270 square miles, has about 100,000 inhabitants, and lies east of Fiji and south of Samoa. The islands were united under a single ruler, King George Tubou I, in 1843, and became a British protectorate in 1900. The country gained full independence in 1970 but remained a member of the British Commonwealth. The present king is George Tubou IV, a great-great-great-grandson of the founder of the dynasty.

On the advice of a German resident, Mr. F. T. Goedicke, the present king's great-grandfather, King George Tubou II, founded the Order of the Crown of Tonga in 1913. It is unusual for a ruler of a protectorate to create an order, but there was a parallel case in the creation of the Order of the Brilliant Star, which the Sultan of Zanzibar distributed as the ruler of a British protectorate.

The Order of the Crown of Tonga had two officers, the Royal Commissioner and the Chancellor-Registrar; Captain Charles Fein and F. T. Goedicke were named to these positions. The order had four classes: Knight Grand Commander, Knight Commander, Commander, and Companion. The two higher classes were clearly intended to carry a knighthood.

It is not known whether the order had written statutes. We have therefore no official knowledge about the design of the insignia, but we can gather some evidence from the few still existing specimens.



The rarity of the insignia of the order is explained by the fact that King George Tubou II ordered only twelve sets, three of each class, from a German jeweler. They arrived in Tonga in May 14, 1914, and the king bestowed the first class on Mr. Goedicke the same day. There is some confusion here, as a photograph indicates that on the next day Mr. Goedicke was installed as a commander of the order; it is unheard of for someone to receive a lower class of an order after having previously received a higher class.

Queen Takibou, the king's second wife, was appointed Knight Grand Commander first class. It seems likely that Captain Fein, as the Royal Commissioner of the Order, was accepted in one class of the order. These, however, may be the only bestowals ever made. In the summer of 1914 World War I broke out, and the king decided to postpone further bestowals. This decision may have been made under British influence because the order clearly had German connections. Unfortunately King George Tubou II died on April 29, 1918, before the end of the Great War, and with him the Order of the Crown of Tonga fell into oblivion.

Dr. Gustav von Tammann, Professor of Astronomy at the University of Basel, is a authority on Asian and African orders.

Very little is known about the Order of the Crown of Tonga, but the Knight Grand Commanders of the Order of the Crown of Tonga certainly had a red and white sash ribbon, from which the badge of the order hung. In addition they wore a silver gilt, seven-pointed star on their breast (above). The inscription reads Koe Otua Motoga Ko Hoku Tofia (God and Tonga are my inspiration). The only known insignia of a Knight Commander is preserved in the Honeyman Collection. The badge is similar in design to the star. Photograph by Dick Meier.

Orders in the Modern Era

by J. ROBERT ELLIOTT

With the conclusion of World War I, the map of Europe changed markedly. So too did many of its governments. Old ruling houses collapsed, such as the Habsburgs of Austria, the Romanovs of Russia, and the Hohenzollerns of Germany. Many traditions disappeared, including the ancient orders of chivalry that were so closely tied to the ruling houses' very existence. After 1918 the Order of the Golden Fleece of Austria, the Order of Saint Andrew of czarist Russia, and the Order of the Black Eagle of Prussia passed into history.

The new Republic of Austria replaced its Order of the Golden Fleece with the Order of Merit. The Weimar Republic broke completely with tradition and established no national orders, while in Russia the strongly religious overtones of the Orders of Saint Andrew, Saint George, and Saint Vladimir were replaced by socialist peoples orders such as the Hero of Social Labor and the Order of the Red Banner of Labor. When the Ottoman Empire of Turkey tottered and fell so too did its orders of Nishan-Imtiaz and Osmania, these being replaced by a solitary medal—the Independence Medal, Turkey's only national award to this day. This medal was first awarded for gallantry or service during the War of Independence (1919–22).

The post-World War I era saw such states as Montenegro and Serbia disappear as they joined the newly created Kingdom of the Serbs, Croats, and Slovenes, which became Yugoslavia in 1929. New states such as Czechoslovakia, Poland, and the short-lived Baltic States of Estonia, Latvia, and Lithuania created national orders to identify their newly won independence and sovereignty. Examples include the Order of Polonia Restituta (Poland Restored) and the Order of the Cross of Liberty of Estonia. Often medieval national heroes served as inspiration for establishing a sense of tradition and legitimacy. Even the Soviet Union used the national hero Alexander Nevsky for a bravery order during World War II. (Curiously, there was a czarist Order of Saint Alexander Nevsky; however, the Soviets dropped the Christian "Saint.")

Wars tend to bring about a proliferation of orders, decorations, and medals. During World War II many awards came into existence. In Germany the Third Reich became a medal manufacturer's paradise. Many of these Third Reich

awards may be worn today; however, national law dictates that the swastika must be removed and such awards can only be worn in the new form with the swastika replaced by three oak leaves on a stem as seen on the current Iron Cross.

World War II affected other orders in various ways. It caused little change in the Japanese orders; after World War II only one order, the Order of the Golden Kite, was forbidden because of its strictly militaristic character. Italy, however, saw all of its royal orders disappear along with its kingdom, including one of Europe's grand orders of chivalry, the Order of the Annunciation. The other kingdoms of the Axis, such as Romania, Bulgaria, and Hungary, also vanished along with their orders of knighthood shortly after World War II. With their absorption into the Soviet bloc a new system of orders evolved, patterned after that of the Soviet Union. They did, however, retain a degree of nationalism by naming some orders after prominent local socialists such as the Order of Georgi Dimitrov (Bulgaria), and the Order of Clement Gottwalde (Czechoslovakia).

The demise of empires and the colonial system following World War II is also reflected in the orders of the Third World nations. These newly independent nations established orders to reward meritorious services in the development of the new state or for accomplishments in the realms of agriculture, sports, arts, and sciences. They often closely followed the structure of those of the former ruling European nations. The African nations, upon declaring their independence in the 1960s, quickly instituted their new orders of merit. These are mostly called the National Order; however, in some cases these orders of merit took on a more regional title such as the Order of the Leopard of Bophutatswana.

The Arabic nations have also manifested their independence from Turkey or European protectorate status by creating orders of merit, such as the Egyptian Order of Independence and the Order of the Republic. During the kingdom period, Egypt had an Order of the Nile. Despite the abrupt change in government from kingdom to republic, the Order of the Nile survived, although it was redesigned to meet the requirements of the newly created republic—the royal crown was replaced by the republican eagle.

Orders of merit are found today in al-



Emperor Hirohito of Japan in 1928, shortly after ascending the throne. He is wearing the Order of the Chrysanthemum on a collar around his neck.

most every country in the world, with very few exceptions; Switzerland and the United States are among the few nations that apparently believe that citizenship, duty, and patriotism do not need the recognition associated with a system of orders. Napoleon Bonaparte once said, however, that "the people yearn for distinctions." After Napoleon instituted the Legion of Honor with its red ribbon in 1802, he is reported to have said that if he had enough "red ribbon" he could conquer the world.

Mr. Elliott is a former president and current member of the board of directors of the Orders and Medals Society of America.

FOSSILS FROM THE AUSTRALIAN DREAMTIME

Kadimakara

by P. V. Rich



(Above) *Rhoetosaurus* was a giant plant-eating dinosaur whose fossils are found in terrestrial Jurassic (140 to 195 million years ago) rocks of southern Queensland. It was a sauropod, a member of the dinosaur group that includes the largest of all land animals.

(Left) Dr. R. A. Stirton (right) and a colleague on an early expedition into central Australia. Dr. Stirton, of the University of California, Berkeley, pioneered a decade of intensive field search for fossil mammals in Australia from the mid-1950s to the mid-1960s. Photograph by Dr. R. H. Tedford.

(Right) *Platypterygius australis*, an ichthyosaur from the Cretaceous (65 to 140 million years ago) shallow sea that flooded the Australian continent. An agile, rapid swimmer, this species grew twenty to thirty feet in length. Here *P. australis* has caught a squidlike belemnite, a member of a group that became extinct in the Eocene (36 to 57 million years ago) period.

“According to the traditions of some Australian Aborigines, the deserts of Central Australia were once fertile, well-watered plains. Instead of the present brazen sky, the heavens were covered by vault of clouds so dense that it appeared solid; where today the only vegetation is a thin scrub there were once giant gum-trees, which formed pillars to support the sky; the air, now laden with blinding, salt-coated dust, was washed by soft, cooling rains, and the present deserts around Lake Eyre were once a continuous garden.

“The rich soil of the country, watered by abundant rain, supported a luxuriant vegetation, which spread from the lake shores and the river-banks far out across the plains. The trunks of lofty gum trees rose through the dense undergrowth and upheld a canopy of vegetation that protected the country beneath from the direct rays of the sun. In this roof of vegetation dwelt the strange monsters known as the ‘Kadimakara.’

“Now and again the scent of the succulent herbage rose to the roof-land and tempted its inhabitants to climb down the gum-trees to the pastures below. Once, while many Kadimakara were reveling in the rich foods of the lower world, their retreat was cut off by the destruction of the three gum trees that were the pillars of the sky. They were thus obliged to roam on earth, and wallow in the marshes of Lake Eyre, till they died, and to this day their bones lie where they fell. After the destruction of the gum trees, the small holes in the forest-roof increased in number and size, until they touched one another, and all the sky became one continuous hole.” (J. W. Gregory, *The Dead Heart of Australia*, 1906, pp. 3–4).

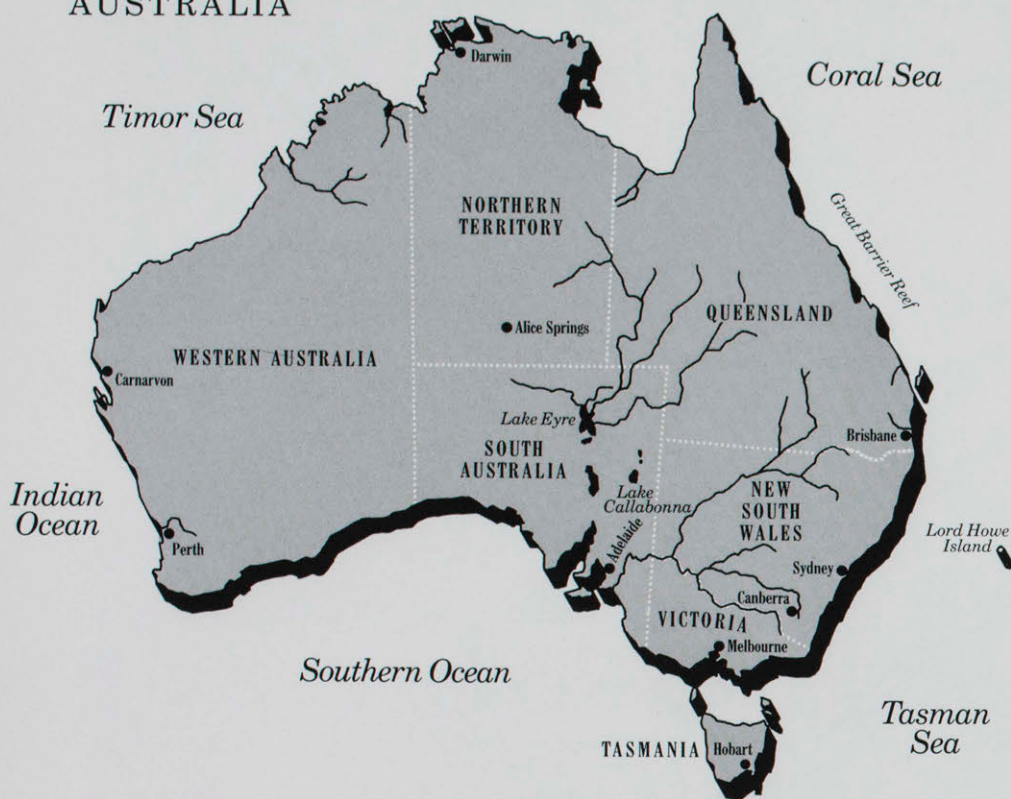
So goes the Dieri (an Australian Aborigine people) legend of how the bones of extinct, gargantuan animals came to lie on the surface of salt pans in the Lake Eyre Basin and along Cooper Creek. These were of the Kadimakara or Dreamtime animals, which no longer exist.

The Dieri legends were not far from the theories we accept today about just what these bones signify. The Lake Eyre Basin was once more well-watered and supported a diverse array of medium-size plant-eating marsupials, dolphins, primitive platypi, flamingoes, and gigantic lungfish—in the Miocene Epoch, some 15 or so million years ago. The bones the Dieri probably saw along such salt pans as Lake Callabonna, however, were from a much younger time, the Pleistocene, perhaps no older than a few tens of thousands of years. *Diprotodon* was one of the most common marsupials of these times and probably lived under conditions not too different from those that exist today in this region.

The Kadimakara have many tales to tell about Australia's past 500 million



AUSTRALIA



alike, the Kadimakara are also useful tools in determining the age of the rocks in which they occur. By studying the rock sequences in which fossil vertebrates occur, the paleontologist gradually pieces together a composite sequence, a patchwork of rocks and fossils, one on top of the other. Then when an isolated bone or tooth is found, a geologist can estimate the age of the rocks from which it came, fitting it in to the known sequence.

Finally, the bones and teeth of the Kadimakara allow reconstructions of the animals themselves to be made. From the fossil fragments it is possible to determine if the animals were runners or diggers, grazers or browsers, and what part of the ecosystem they inhabited. Reconstruction of whole faunas can be made and then compared to the living ones of today, keeping in mind the biasing factors that are inherent in the fossil record.

The Kadimakara hold many secrets of the past that are being unlocked by vertebrate paleontologists. Much has been discovered in the past 150 years since Australian vertebrate paleontology had its beginnings—discoveries made by professional and amateur alike. With this continued cooperation and field and research support supplied by museums, the Australian Research Grants Scheme, the National Geographic Society, and many other private sector trusts, compa-

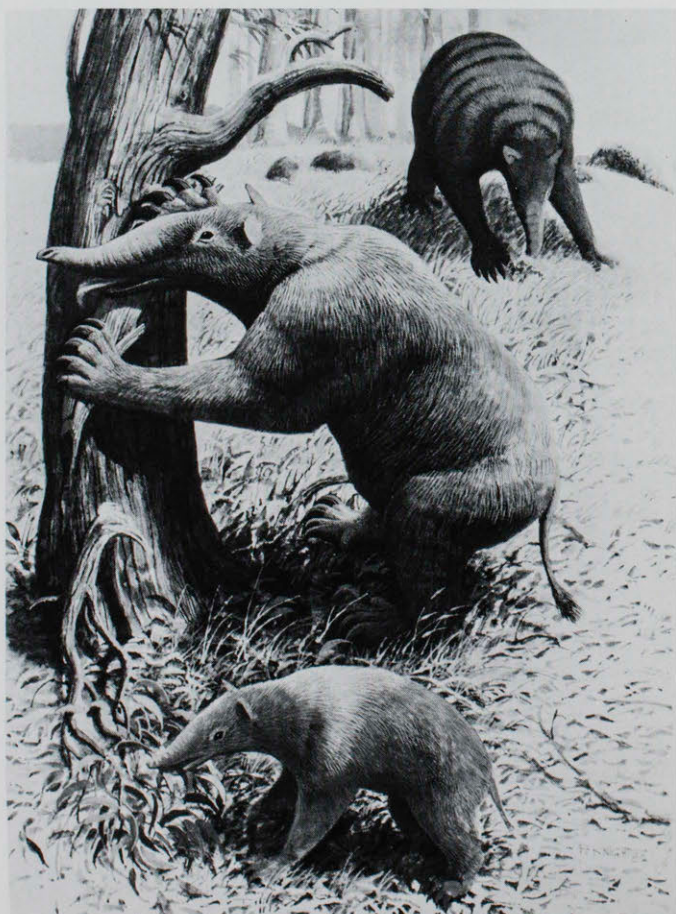
Continued on page 26

Fossils of the Australian Dreamtime: Kadimakara will be on display in the museum's Governor's Gallery from April 9 through June 26, 1988. The exhibition is sponsored in part by the Australia & New Zealand Bank.

years. Their bones give some idea of the evolutionary pathways followed by backboned animals in Australia and how such paths compared or differed from those of the vertebrates from the rest of the world. The history of marsupials on this continent, for example, has been very distinct from that on any other continent. It has provided a unique and varied independent experiment in mammalian evolution, allowing comparison of, for instance, evolutionary rates with those of mammals on other larger and more interconnected continental masses such as North America and Europe. It reveals that some of these rates in Australia may, in fact, be slower.

The Kadimakara, in addition, allow the reconstruction of the peregrinations that vertebrate animals have or have not taken between different continents in times past. This gives an independent cross-check on the continental drift maps provided by seismologists, geophysicists, and geologists. The Late Devonian fossil fish record of Australia, for example, is more like that of China than that of any other part of the world, suggesting that freshwater fish may have moved back and forth between these areas at that time. This is in agreement with the maps of the world for 360 to 370 million years ago.

For the paleontologist and geologist



Page 24:

Palorchestes azael and *Palorchestes parvus* were surely among the most unusual mammals ever to have lived. The *Palorchestes* seen in the foreground was the size of a large bull. It became extinct some 20,000 years ago, and its remains are found largely in southeastern Australia. Its exceptionally powerful forearms, massive claws, and bizarre head would surely have been enough to have inspired the legend of the bunyip—a legendary Aboriginal swamp-dwelling, man-eating monster.

About 480 million years ago what is now the dry center of Australia was covered by a widespread shallow sea inhabited by rich marine faunas. There were mainly invertebrates—trilobites and various mollusks, bivalves, gastropods, and straight-coned cephalopods. Fossils of *Arandaspis prionotolepis*, one of the earliest vertebrates, also occur in these rocks. It was a rather sluggish bottom-living animal, a member of the primitive armored jawless fish known as ostracoderms. The preservation indicates that these fish lived and were buried near where they died in a shallow-water, near-shore marine environment. A smaller related form is shown in the middle distance.



Many species of flamingoes or flamingo-like birds graced the landscape of Lake Palanarinna in northern South Australia 15 million years ago. In the foreground, *Phoeniconotus eyrensis* tends a nestling. The more gracile *Phoenicopterus novaehollandiae* feeds in the middle distance, while the white flamingolike palaeolodids stand in the background. The nearest relatives of the palaeolodids lived in Europe and North America at this time.

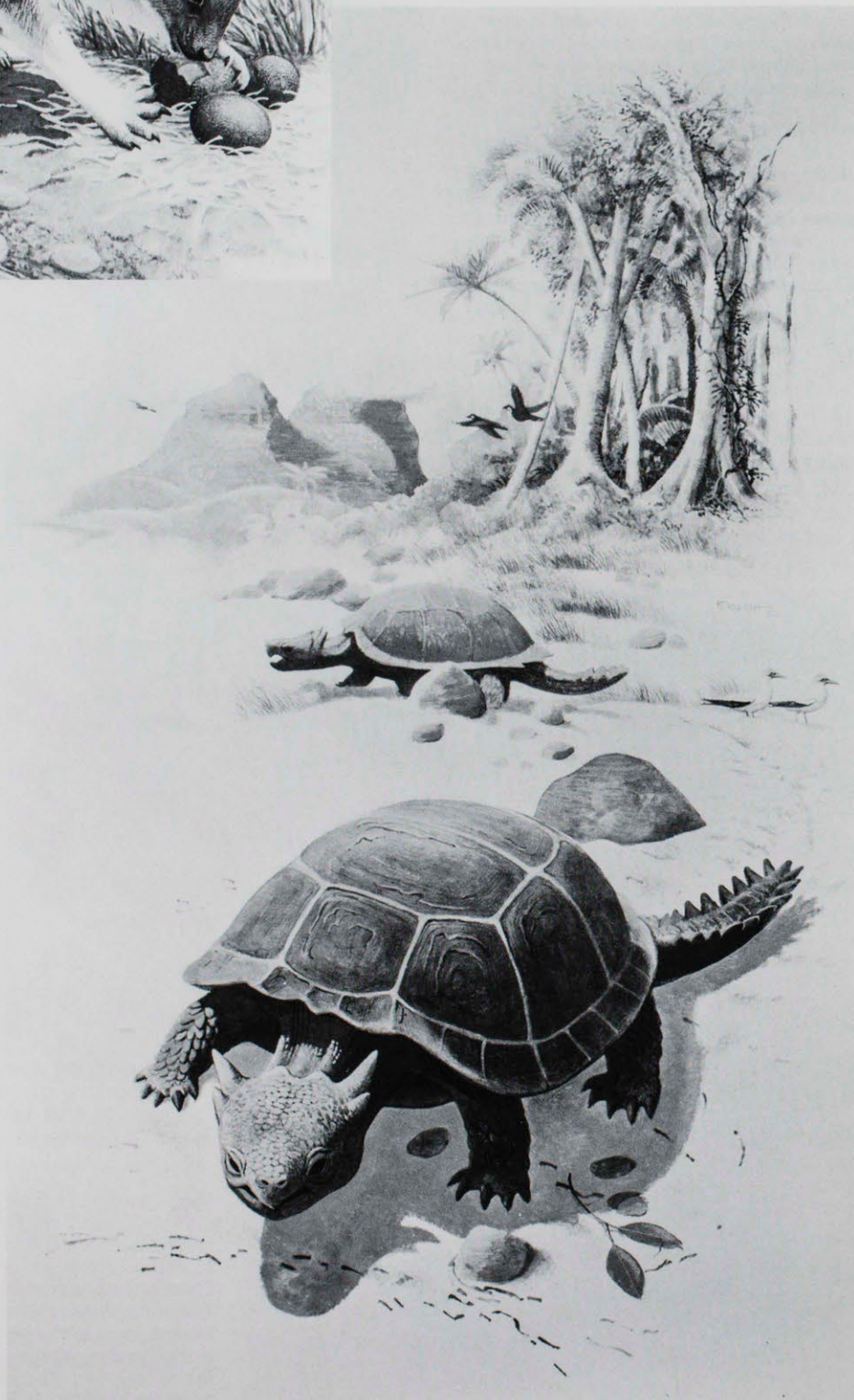


Proleopus oscillans, killer kangaroo or strange but peaceful herbivore? These are some of the possibilities facing the scientists studying the remains of the extinct Giant Rat Kangaroo, which lived in southeastern Australia 26,000 to 18,000 years ago. There is evidence supporting both interpretations. Here artist and scientist have taken a middle path and portrayed Proleopus raiding an emu nest.

nies, and individuals, much more is bound to be discovered. So much is yet to be understood about the origin and evolution of vertebrates on this continent, the reasons why Australia has served as a refuge at the end of the world for numerous groups of backboned animals, the effects of changing latitude and climate on the fauna of a continent that has moved a drastic 20 to 25 degrees in latitude during the last 40 million years—and is still moving. So much is yet to be discovered, which is what makes the search for more Kadimakara a fascinating endeavor!

Dr. P. V. Rich is a Senior Lecturer in the Earth Sciences and Zoology Departments at Monash University, Clayton, Victoria, Australia. She and her students are interested in the origin and evolutionary patterns of the Australian backboned animals and their environments over the past 400 million years, in particular with respect to those of Southeast Asia and South America. This article is excerpted from Kadimakara: Extinct Vertebrates of Australia by P. V. Rich, G. F. van Tets, and F. Knight, Pioneer Design Studio, Australia (1985).

Fossils of Meiolania platyceps, a horned turtle, have been found in 40,000-year-old beach and lagoon sediments on Lord Howe Island, a volcanic remnant in the Tasman Sea. The environment on Lord Howe Island was similar to that at the present, but the turtle, the Tasman booby, and Lord Howe Island pigeon (seen right and left in the background) are gone.



Gala Evening Honors Gloria and Jimmy Stewart. The festive opening of the **Hollywood: Legend and Reality** exhibition honored Gloria and Jimmy Stewart for their dedication to the Natural History Museum and its programs. Pictured with the Stewarts are Northrop Corporation Chairman and Chief Executive Officer Tom Jones and his wife Ruth. The museum gratefully acknowledges the generous support of Target Stores, Turner Entertainment Company, a subsidiary of Turner Broadcasting, Inc., Northrop Corporation, and The Mary Pickford Foundation, which were the local sponsors for the **Hollywood: Legend and Reality** exhibition. In addition to direct support of the exhibition, Target Stores and Turner Entertainment Company provided additional advertising and promotion to reach new museum audiences. The **Hollywood: Legend and Reality** exhibition was organized by the Smithsonian Institution Traveling Exhibition Service and made possible nationally by a generous gift from Time Inc.

The Hollywood Leadership Committee, co-chaired by David Comsky and Mrs. Robert Petersen, provided the impetus for the funding and special promotion of the **Hollywood: Legend and Reality** exhibition. The museum salutes committee members Cindy Bell, Cynthia Comsky, Bob Graham, Diana Jacobs, Frank Johnson, Linda Dyer Knight, Carole Sumner Krechman, Brad Marks, Patty Patano, Jack Pike, Jonas Rosenfield, Richard Smooke, Gloria Stewart, Jane Turner, and Lew Wolff for advice and encouragement in preparation for the largest temporary exhibition ever hosted by the Natural History Museum.



suming chore of hand cataloging each fossil in a laboratory logbook. In addition, computer imaging will expand paleontologists' research abilities by acting as a kind of photographic memory—letting researchers see how fossils fitted together in a deposit long after they have been removed.

The AT&T gift is the realization of a dream that began in 1985, when museum paleontologists started working on the first of twenty fossil blocks uncovered during the Page Museum's construction ten years earlier. The blocks contain one of the most important discoveries ever made at Rancho La Brea: the partially articulated skeletons of saber-toothed cats, bison, dire wolves, an American lion, horse, and a whooping crane. Because Rancho La Brea's fossil deposits usually contain the jumbled bones of many different kinds of animals, scientists are rarely sure that the bones from the same type of animal belonged to the same individual. Articulated skeletons, on the other hand, give scientists a precise idea of how a single animal from a long-extinct species would have looked.

So far, work on the blocks has turned

up parts of the only two articulated California saber-tooth cat skeletons known to science. Paleontologists speculate that the deposit may be the record of a single event that occurred in the asphalt seeps of Rancho La Brea 15,000 to 20,000 years ago.

Without the aid of a computer, measurement, cataloging, and extraction of the articulated fossils was expected to take almost twenty years. With AT&T's gift, the job may now be finished in ten. The system will be fully functional in about ten months.

Zimmerman Joins Trustee Board.

William R. Zimmerman, president of Zimmerman Holdings, Inc., has been elected to the Natural History Museum Foundation Board of Trustees. As a trustee, Zimmerman will help direct the museum's long-range programs and oversee its operations. As community leaders, the Trustees create a bridge between the southern California public and the various activities of the museum.

The museum post is the latest in Zimmerman's distinguished career. Before

heading the corporation that bears his name, Zimmerman was president of Monogram Industries, Inc. and president and chief executive officer of Swedlow, Inc. He also served as executive vice-president of Avery International and was a management consultant for several years.

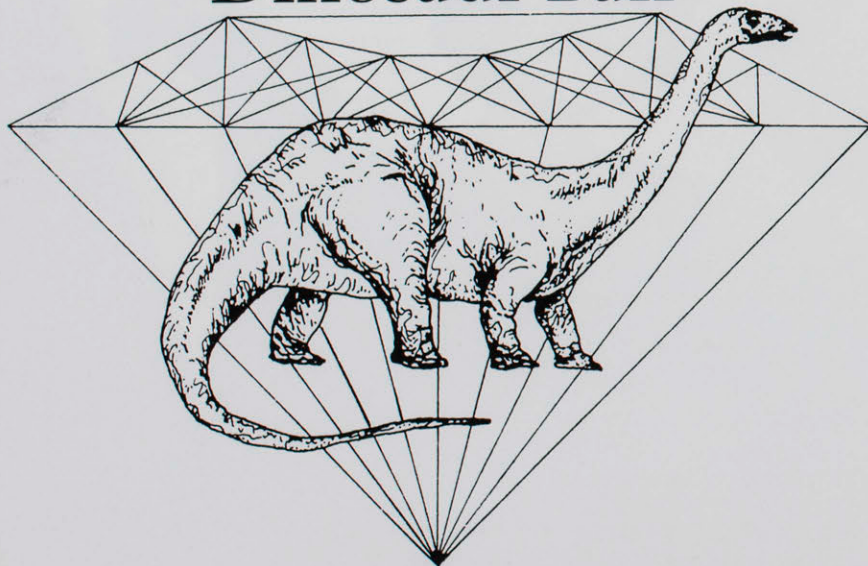
Zimmerman is currently on the Board of Directors of Denny's and is a Planning Committee Trustee for the City of Hope. He is also a trustee of Harvey Mudd College. He received a B.S. and an M.S. in Industrial Management from the Massachusetts Institute of Technology. He is a member of the California Club and the Valley Hunt Club.

Ralph M. Parsons Gift to Help Underwrite School Tour Program. A generous gift from the Ralph M. Parsons Foundation to the museum's School Tours Program will support the educational outreach effort through the public and private schools of southern California. The effects of this important grant, dedicated to the education of young people, will reach far into the future.

The museum is a treasure house of objects, specimens, artifacts, and works of art of astonishing range and diversity. Each year nearly 200,000 children visit the museum in organized tours from schools as distant as Kern, San Bernardino, and Orange counties and as near as the 32nd Street School and Dorsey High School in Los Angeles. The learning these tours provide is very different from that prompted by the printed page or formal lecture. Crucial concepts come alive when they are presented through touch, sight, and sound rather than text alone: to stand next to a *Stegosaurus* skeleton is wholly different experience from reading about a dinosaur; to examine a pre-Columbian urn from the Zapotec culture and compare it with another from a succeeding people yields more information than scanning a two-dimensional illustration. With the gift of the Parsons Foundation, the Education Division will be able to produce a pre-visit study guide, train docents to cover a variety of subjects, and develop publicity for the museum's education programs to increase outreach to underserved areas.

One highlight of the School Tours Program will naturally be the museum's Ralph M. Parsons Discovery Center.

DIAMOND EDITION Dinosaur Ball



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BOOK REVIEWS

Since its opening in April, the center has enjoyed enormous popularity with children and their families, who share in the many hands-on activities available there. The Education Division anticipates that a total of 14,000 to 21,000 children will visit the Discovery Center in organized school tours each year.

This generous grant continues the commitment to the children of this community the Parsons Foundation established in its sponsorship of the Ralph M. Parsons Discovery center. Thanks to the Parsons Foundation, the invaluable learning experiences children need to supplement their classroom training will continue to be an important part of the museum's contribution to the people of southern California.

Museum Designers Win Edwin F. Guth Memorial Award of Merit. Daniel B. Howell, Senior Museum Technician, and Richard Young, Senior Audio Visual Coordinator, have received the Edwin F. Guth Memorial Award of Merit. This award was presented by the Illuminating Engineering Society of North America to the designers for their lighting work on *Maya: Treasure of an Ancient Civilization*, which was on display at the museum in 1985.

New TERRA Editor. Robin A. Simpson, Head of Museum Publications, has announced the appointment of Kathy Talley-Jones as editor of TERRA. Ms. Talley-Jones has worked as Associate Editor of the magazine for the past three years. She has produced the last two museum wall calendars, and in addition to working closely with staff and outside writers, photographers, and illustrators, shepherds the magazine through production. She also oversees the Calendar of Events and other projects.

Ms. Talley-Jones received her B.A. from the University of Texas and following that, worked for Bell Helicopter in Tehran, Iran, shortly before that country's revolution. She had attended high school in that country and was also educated in Japan, Virginia, Texas, and California. She and her husband live in Pasadena with ten turtles, three birds, and some fish.

FLATTENED FAUNA

A Field Guide to
Common Animals of Roads,
Streets, and Highways



ROGER M. KNUTSON

FLATTENED FAUNA: A FIELD GUIDE TO COMMON ANIMALS OF ROADS, STREETS, AND HIGHWAYS by Roger M. Knutson, Ten Speed Press, 1987. Paper, 88 pages, \$4.95.

Not long after I joined the museum staff three years ago, I received a call from a member who started out by apologizing for asking what might be construed as a crackpot question. She wanted to know if there were a field guide for identifying road-killed animals, something that would be very helpful for the amateur naturalist. I chuckled and stated that to my knowledge, such a book did not exist. It does now, and I wish I had kept her name and number to let her know!

Flattened Fauna is an excellent, well-written illustrated guide to common road birds, mammals, snakes and other reptiles and amphibians that no traveling naturalist should be without. It provides a key for rapid, rough identification at 55 to 65 mph as well as detailed descriptions should you risk leisurely, close examination for more accurate identification. The author provides outline sketches drawn to the scale of a four and one-half-inch-wide road stripe as well as a convenient "death list" (recall that avid birders keep "life lists" of birds seen in their lives) with which the naturalist may record species, highway, and mile marker. He points out that, with good, consistent records, one can note seasonal changes in the types of animals found on roads as well as changes from year to year in animal distributions.

Los Angeles is an ideal place in which to use *Flattened Fauna* for in spite of our urban surroundings, there is a surprising variety of wildlife on our roads. In my own neighborhood I have identified

opossum, raccoon, mockingbirds, pigeons, and rats among the road fauna (please note that this guide does not cover domesticated species). The stretch of Culver Boulevard that crosses the Ballona Wetlands is known as the richest mile of road in the Los Angeles area for flattened fauna. I highly recommend you pick up a copy of this witty, inexpensive, glove-box-size guide and add a little variety to your road trips, whether they be cross-town, up-state, or across the country!

Dr. Sarah B. George
Associate Curator
Section of Mammals

MUSHROOMS DEMYSTIFIED by David Aurora, Ten Speed Press, 1987. Paper, 958 pages, \$24.95.

THE FIELD GUIDE TO MUSHROOMS, NORTH AMERICA by Kent H. McKnight and illustrated by Vera B.



KADIMAKARA EXTINCT VERTEBRATES OF AUSTRALIA

by P.V. Rich, G.F. van Tets and F. Knight

Subject of exhibition
April 9 - June 26
Natural History Museum
of L.A. County

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McKnight, Houghton, Mifflin, 1987. Paper, 429 pages, \$13.95.

THE NEW SAVORY WILD MUSHROOM by Margaret McKenny and Daniel E. Stuntz, revised and enlarged by Dr. Joe Ammirati, University of Washington Press, 1987. Paper, 250 pages, \$19.95.

Mushrooms are the common passion of professional botanists and hobbyists alike. How one gets to know the mushroom is the major communication problem between these two mycological groups.

The primary source of information on mushrooms and other fungi is the technical literature produced by the professional mycologist. A major concern of the academician is the recognition of the characters that define a species. The amateur mycologist, on the other hand, needs a clear-cut set of rules to use in finding and naming edible mushrooms.

This gap in the mushroom technology transfer from the professional to the amateur mycologist has been recently met by the publication of several field guides authored by researchers. The amateur mycologist fortunately now has a better choice of excellent references prepared by professional mycologists in addition to the long-standing excellence of the field guides by Alexander Smith and his students; these include *The Mushroom Hunter's Field Guide* and the *Field Guide to Western Mushrooms*.

Mushrooms Demystified by David Aurora is representative of the amateur-authored publication. The author explains his approach in a preface to the second edition: "I get credit for writing this book; the many mycologists whose monographs and articles form its factual foundation do not." The author attempts to bring the technical literature within the reach of the hobbyist. His sections on mushroom families sacrifice a certain degree of exactitude by interpreting many species broadly. "I see no harm in applying the name to the 'complex' [a group of similar species] providing readers are made aware of the situation Purists may object to this approach, but there are many amateurs who would like to apply names to these 'complexes' even if they are unequipped to make the subtler distinctions between species or varieties within a complex." Black and white as well as color photographs of primarily California species make field comparisons possible. Figure 217 of a green-faced epicure overindulg-

ing will surely deter mushroom poisoning.

The Field Guide to Mushrooms, North America, is a good addition to the Peterson Field Guides. Professional mycologist Kent H. McKnight and mushroom illustrator Vera B. McKnight have prepared a hand-size volume that should assist with identifying mushrooms and determining their edibility. The typical mushroom families and related groups such as the sac fungi and the jelly fungi are discussed. Information is given on a specie's field characters along with technical notes. The appearance of the fruiting, the edibility, and other similar species are standard discussion points. The only silliness is the publisher's insistence that each and every species be given a common name. Thus the authors have made up such names as Yellow Rider, Dazzling Cup, Lizard Claw, and so on and on.

The New Savory Wild Mushroom was prepared by University of Washington mycologist Dr. Joe Ammirati to answer such questions as "what is it?" and "is it good to eat?" Common-sense guidelines to collecting mushrooms form the introduction to this collection of information on West Coast mushrooms. Each species, again given a made-up common name, is discussed with sections on color and description, when and where found, and special remarks. A color photograph illustrates the descriptions. The book is small enough to hold in the hand as one rushes from find to find and not get in the way.

The best of the technical literature on California mushrooms is written by the dean of West Coast mycologists, Dr. Harry Thiers of San Francisco State University. Mad River Press has undertaken the publication of Dr. Thiers and other professional mycologists' carefully prepared, uncomplicated species descriptions. Field characteristics, microscopic appearance of spores and tissue, the geographic distribution of the species, and other data are derived from first-hand experience and the interpretation of the technical literature. Interested amateur mycologists should look for *The Families Cantharellaceae, Gomphiliaceae, and Paxillaceae* by Thiers, *The Family Agaricaceae* by R. Karrigan, and *The Marasmioid Fungi* by D. Desjardin.

Dr. Don R. Reynolds
Curator
Section of Botany

THE MONARCH BUTTERFLY: INTERNATIONAL TRAVELER by Fred A. Urquhart, Nelson-Hall, 1987. Cloth, 232 pages, \$24.95.

In 1976 the discovery of one of the most spectacular natural phenomena on earth was announced: the southern wintering grounds of the Monarch butterfly of eastern North America. An estimated 100 million butterflies spend six months of the year hidden in a handful of mountain canyons in central Mexico waiting for the arrival of spring to repopulate North America. The story of the forty-year search for the colonies by Fred and Nora Urquhart is vividly described in *The Monarch Butterfly: International Traveler*.

The highlights of the book lie in Urquhart's descriptions of his studies of the migration patterns of the Monarchs. We learn of the long, frustrating search for a method of accurately tracking the migrating butterflies. At first Urquhart marked the Monarchs with various dyes and paints. After several years he developed self-adhesive paper tags bearing individual numbers and his mailing address. Four hundred thousand Monarchs were tagged by Urquhart and his volunteers over a period of some three decades. Like a trail of footprints across a virgin snowfield, the recovered butterflies pointed to the wintering colonies in Mexico. This method is used today by entomologists in population studies; we are employing it in the Natural History Museum's study of the Monarchs of western North America.

Unfortunately, the book includes only a few results from other Monarch researchers. There are a number of technical errors in the description of the morphology and biology of the butterfly. The bibliography is incomplete with only 23 citations; a bibliography in preparation by the Entomology Section of this museum contains over 150 popular and scientific papers, books, and newspaper stories about the Monarch.

Perhaps the most distressing is the treatment given to the human threats to the Monarch. Wintering colonies in both Mexico and California have been eliminated when the forests have been cut for timber or firewood or by agricultural and urban development. Urquhart dismisses the problem in Mexico by stating the colonies will be lost only if deforestation occurs over the entire transvolcanic mountain range. In contrast, Laura

Snook of Yale University has found significant evidence showing this scenario is highly likely to occur by the end of the century. No mention is given to the loss of colonies in the Golden State, nor of serious efforts by such agencies as the Coastal Commission and the California Department of Parks and Recreation to protect the sites.

However, in spite of these shortcomings this book serves its purpose quite well of presenting general information about the migratory Monarch to the lay reader or beginning naturalist. Interest by entomologists, wildlife conservationists, and the public in these cinnamon sailors is growing at a geometric rate. *The Monarch Butterfly: International Traveler* will answer some of the common questions as well as spark further interest in these amazing insects.

Christopher D. Nagano
Research Associate
Entomology Section

THE EDGE OF FIRE: VOLCANO AND EARTHQUAKE COUNTRY IN WESTERN NORTH AMERICA AND HAWAII, text and photographs by Robert Wenkam, Sierra Club Books, 1987. Cloth, 162 pp., \$35. Featuring over 100 spectacular photographs, this book captures the tumultuous geological story of the west coast of Central and North America, a subject of great interest to southern Californians. This book, written by the first photographer to record the beginning of a volcanic eruption, introduces readers to the latest scientific concepts of plate tectonics, seismic disturbances, and volcanology as well the treasury of oral history, lore, legend, and myth surrounding geologic activity.

ONE MAN'S OWL by Bernd Heinrich, Princeton University Press, 1987. Cloth, 224 pp., \$19.95. Combining reflections on natural history with a journal of an owl's development—a "soggy, sorry-looking bundle of misery" that the author adopted when it was too young to survive by itself—this book is an engaging and personal chronicle. It provides a description of a naturalist at work (the author is professor of Zoology at the University of Vermont) as well as a series of thoughts on our relationship with the natural world and of its value to us.

WILDFLOWERS OF THE AMERICAN WEST, text by Rose Houk, Chronicle Books, 1987. Cloth (\$27.50) & paper (\$14.95), 120 pp. Less a compendium than a celebration of wildflowers, this book presents the subtle beauty and the glori-

ous variety of native American plants. It includes only those western wildflowers that are native species; these plants are lusciously photographed and illustrated in this beautifully designed book.

Encounters of the Prehistoric Kind

Animated Dinosaurs on Display at the San Bernardino County Museum

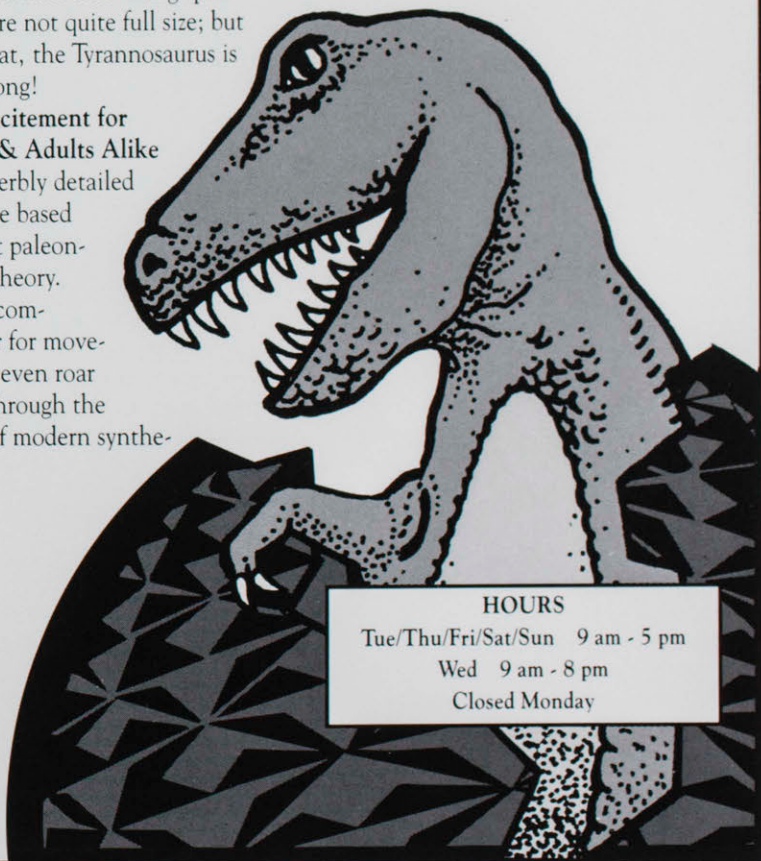
From February 27 through May 8, 1988, seven animated prehistoric reptiles will be on display at the San Bernardino County Museum in Redlands. Two are full-size, including a Pteranodon with a 26' wing span. The rest are not quite full size; but even at that, the Tyrannosaurus is over 23' long!

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These superbly detailed replicas are based on current paleontological theory. They use compressed air for movement and even roar and hiss through the wonders of modern synthe-

sized sound. This is a show the whole family can enjoy. Adults \$3, school age children \$2, seniors \$1, pre-school children free.

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Casts of an adult saber-toothed cat skull are for sale at the George C. Page Museum Shop. The saber-toothed cat, *Smilodon californicus*, is the California state fossil. This lion-size carnivore lived during the last Ice Age and became extinct about 10,000 years ago. Many hundreds of *Smilodon* specimens have been recovered from the Rancho La Brea asphalt deposits (tar pits) in

Hancock Park. Our reproduction is cast from a real skull and is made of hand-painted resin mounted on a wooden base. This unusual item is priced at \$225. Other Ice Age mammal fossil reproductions are available, and mail and telephone orders will be accepted.

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